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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/030,087

01/14/2002

Masahiro Hatakeyama

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09/08/2004

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EXAMINER

JOHNSTON, PHILLIP A

ART UNIT

PAPER NUMBER

2881

DATE MAILED: 09/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/030,087

Applicant(s)

HATAKEYAMA ET AL.

Examiner

Phillip A Johnston

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to Amendment dated 6-29-2004, wherein Claims 1,5 and 12-22 are amended, and claim 2 is cancelled. Claims 1, and 3-22 are pending.

Examiners Response to Arguments

2. Applicants arguments are moot in view of new grounds for rejection.

Claims Rejection – 35 U.S.C. 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

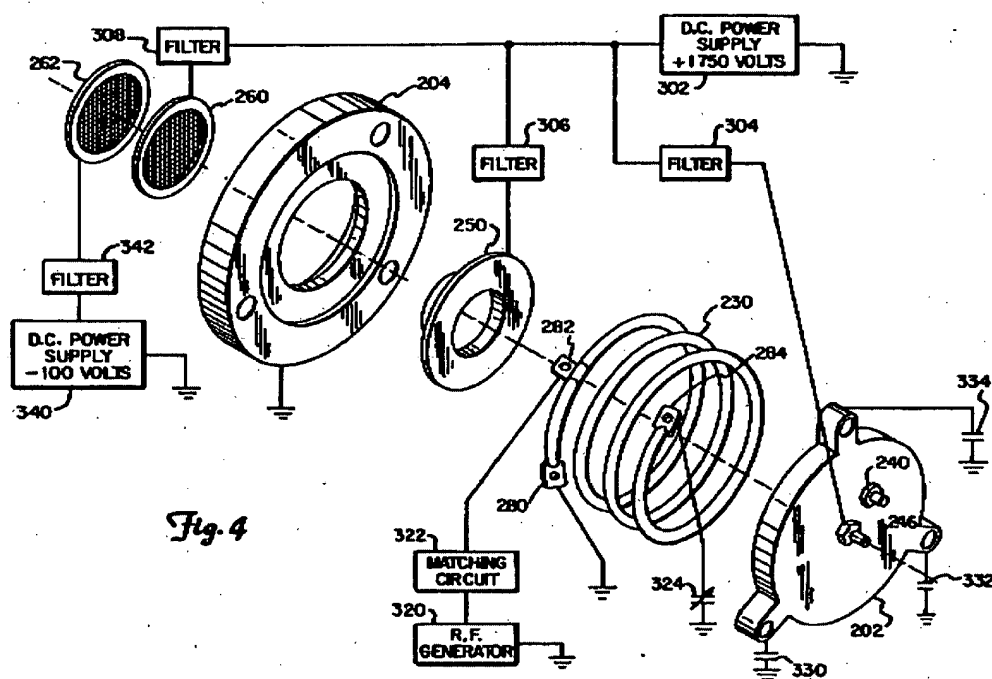
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1,3, and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,216,330 to Ahonen, in view of Hashimoto, U.S. Patent No. 4,870,284, and England, U.S. Patent No. 5,969,366.

Ahonen (330) discloses an ion beam source having a plasma chamber formed between electrode 242 and mesh electrode 260, connected at the same potential, and a plasma generating means (coil 230 and RF supply 320) disposed outside the

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discharge tube. An accelerating chamber formed between middle mesh electrode 260, and downstream electrode 262 connected with a voltage supply for accelerating and emitting the beam downstream. A gas inlet and an upstream electrode 242 having a plurality of openings, as recited in claims 1 and 12. See Column 5, line 31-57; Column 6, line 31-68; and Figure 4 below.



Ahonen (330) fails to teach the use of a 1kV acceleration voltage between the mesh electrode and the downstream electrode, as recited in claims 1 and 12.

However, Hashimoto (284) discloses an ion source for thin film deposition that operates in two voltage ranges. The first is an ion beam mixing method, where it is

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required to operate the ion source at voltages of tens of kilo-volts, while, and the second an ion beam assisted method, where it is required to operate the ion source over voltages that range from hundreds to thousands of volts.

FIG. 3A shows the electrical connection for the high voltage operation of the second embodiment, and FIG. 3B shows the electrical connection for the low voltage operation of the second embodiment. See Column 4, line 8-30; and Figures 3A and 3B below.

FIG. 3A

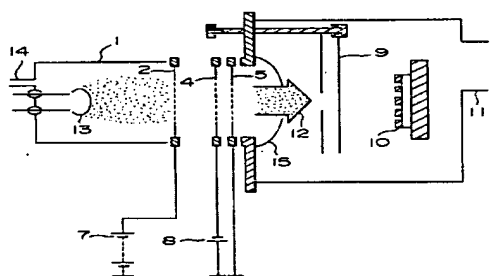
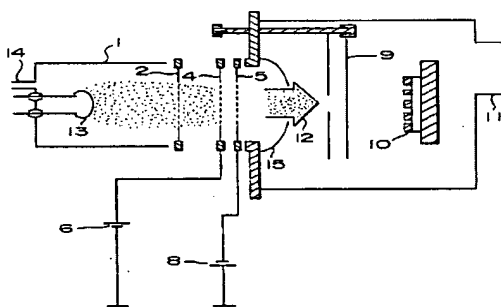


FIG. 3B



Therefore it would have been obvious to one of ordinary skill in the art that the ion source of Ahonen (330) can be modified to use the low voltage application method of Hashimoto (284), to provide an ion source which can operate in a wide operating

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voltage range and hence can draw out an ion beam having a desired energy level in a wide energy level range.

The combination of Ahonen (330) and Hashimoto (284) fails to teach the use of downstream electrodes having the spacings and dimensions as recited in claims 1,3, and 14-16; and

However, England (366) discloses the following;

(a) The first and second apertured plate electrodes 65 and 60 are spaced apart in the beam direction by a distance "a" of less than the smallest transverse dimension w_f (in this case the width) of the beam aperture of the field electrode 61, which is less than 90 mm, as recited in claims 1,3, and 15. See Column 8, line 51-55; and Column 13, line 7-15.

(b) The extraction electrode 23 is at the same potential as the chamber 47, as recited in claim 14. See Column 9, line 15-30.

Therefore it would have been obvious to one of ordinary skill in the art that the ion source of Ahonen (330) and Hashimoto (284), can be modified to use the electrode spacings of England (366) to provide the desired beam focus, thereby providing an improved ion implanter capable of implanting ions at low energy.

5. Claims 5,11,13, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahonen (330), Hashimoto (284), and England (366), and in further view of Savas, U.S. Patent No. 5,983,828.

The combination of Ahonen (330), Hashimoto (284), and England (366), as applied above fails to teach the use of a pulsed voltage source to alternately irradiate

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positive and negative ions, as well as a zero potential applied to the emitting electrode, as recited in Claims 5, 11, 13, and 22. However, Savas (828) discloses that when a low frequency A.C. bias is used, negative and positive ions are alternatively accelerated toward the substrate for etching. Since the etch alternates between negative and positive ions, charge buildup on the substrate surface is avoided. See Column 5, line 60-67, and Column 6, line 1-3.

Savas (828) also discloses that each pulse 601 is followed by a low power cycle during which a low voltage of opposite sign bias is applied to the electrode such that the time average voltage is nearly zero. See Column 12, line 3-16.

It is implied herein that the alternating bias applied to the substrate for acceleration of ions, in accordance with Savas (828) is equivalent to applying a pulse-type voltage, as recited in Claims 5 and 13.

Therefore it would have been obvious to one of ordinary skill in the art that the ion source of Ahonen (330), Hashimoto (284), and England (366) can be modified to use the low frequency A.C. bias of Savas (828), to alternately etch using negative and positive ions, thereby avoiding charge buildup and improving the etch process.

6. Claims 4, 6, 7, 10, 12, 16-18, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahonen (330), Hashimoto (284), and England (366), in view of Savas (828) and in still further view of Kinoshita, U.S. Patent No. 5,518,572.

Ahonen (330) discloses that the screen grid 260 has a plurality of holes approximately 0.075 inches in diameter and having a density of approximately 100 holes per square inch. The accelerator grid 262, similarly, has a plurality of holes

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approximately 0.050 inches in diameter and have a density of approximately 100 holes per square inch, thereby providing an open area ratio of 85% or less, as recited in Claims 10 and 21. See Column 5, line 31-44.

Ahonen (330), Hashimoto (284), and England (366), in view of Savas (828) discloses nearly all the limitations of Claims 4,6,7,10,16-18, and 21, but fails to disclose the dimensions of the electrodes, as recited in Claims 4,6,7,10,16-18, and 21. However, Kinoshita (572) discloses the use of a microchannel plate to produce neutral particles by charge exchange, where the microchannel plate 34 of approximately 160 mm in diameter and approximately 1 mm in thickness having the microchannel holes 34A with diameter d of approximately 12 μm , where the clearance between the microchannel plate 34 and the object S to be processed is set to approximately 1 cm (25mm), as recited in Claims 3 and 15. See Column 13, line 35-38, and Figure 1 below.

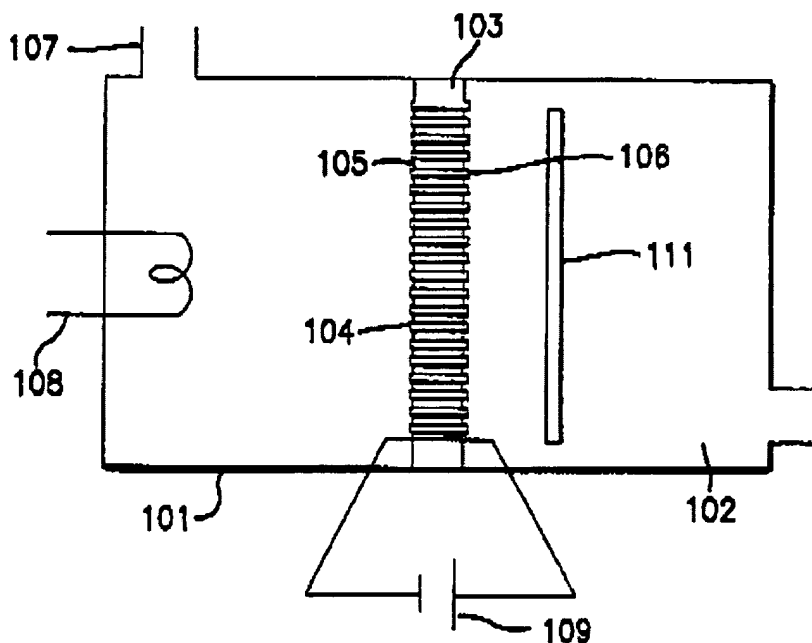


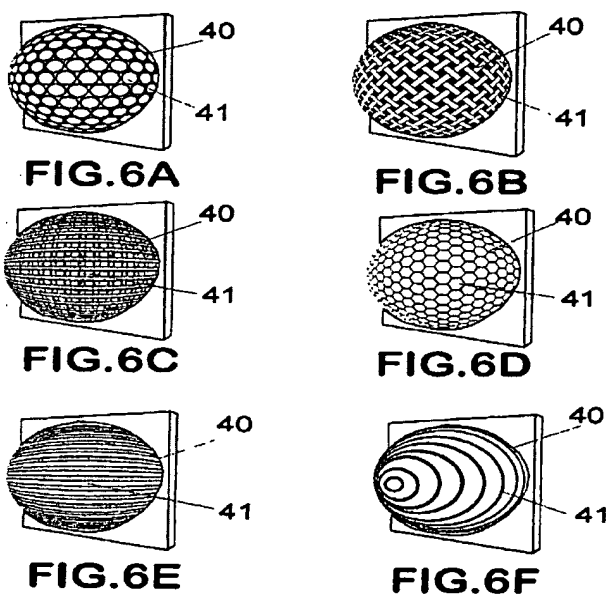
FIG. 1
PRIOR ART

It is implied herein that the dimensions of the microchannel plate of Kinoshita (572) is equivalent to the dimensions of the beam emitting electrode and the mesh electrode, as recited in Claims 4,6,7,10,16-18, and 21.

Therefore it would have been obvious to one of ordinary skill in the art that the ion source of Ahonen (330), Hashimoto (284), and England (366), in view of Savas (828) can be modified to use the microchannel plate electrode of Kinoshita (572), to contain and shape the plasma within the chamber and insure that all ions exiting the emitting electrode can be made incident to the surface of the sample, thereby providing an efficient ion source, as well as irradiating a neutral particle beam onto a sample surface.

7. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahonen (330), Hashimoto (284), and England (366), in view of Savas (828) in further view of Kinoshita (572), and in still further view of Sheehan U.S. Patent Pub No. 2002/0011560.

Ahonen (330), Hashimoto (284), and England (366), in view of Savas (828) in further view of Kinoshita (572) discloses nearly all the limitations of Claims 8,9,16, and 20, but fails to disclose a cross mesh electrode. However, Sheehan (560) discloses several mesh shapes including a cross mesh. See paragraph [0031] and Figures 6A-



6F below.

Therefore it would have been obvious to one of ordinary skill in the art that the ion source of Ahonen (330), in view of Savas (828), in further view of Kinoshita (572) can be modified to use the cross mesh electrode of Sheehan (560), to provide a criss-cross shaped mesh, thereby improving ion collection and focusing efficiency.

Conclusion

8. The Amendment filed on 6-29-2004 has been considered but the arguments are moot in view of new grounds for rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

9. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee

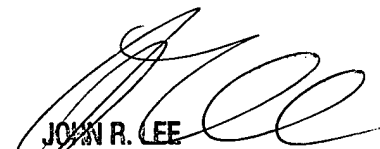
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can be reached at (571) 272-2477. The fax phone number for the organization where the application or proceeding is assigned is 703 872 9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ

August 30, 2004


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SUPERVISORY PATENT EXAMINER
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